DOCUMENT RESUME

ED 469 629 SE 066 763

AUTHOR	Benetti, Bernadete; Marcelo de Carvalho, Luiz
TITLE	Difficulties the Science Schoolteacher Faces To Implement Environmental Education.
PUB DATE	2002-07-00
NOTE	11p.; In: Rethinking Science and Technology Education To Meet the Demands of Future Generations in a Changing World. International Organization for Science and Technology Education (IOSTE) Symposium Proceedings (10th, Foz do Iguacu, Parana, Brazil, July 28-August 2, 2002). Volumes I [and] II; see SE 066 752. Financed by CNPq, Brazil.
PUB TYPE	Reports - Research (143) -- Speeches/Meeting Papers (150)
EDRS PRICE	EDRS Price MF01/PC01 Plus Postage.
DESCRIPTORS	*Environmental Education; *Environmental Influences; Foreign Countries; Intermediate Grades; Junior High Schools; School Organization; *Science Teachers; *Teacher Attitudes; *Teacher Role
IDENTIFIERS	Brazil; *Environmental Problems

ABSTRACT

Considering the science teacher's role in the implementation of environmental issues in school, a survey was carried out (Benetti, 1998) to identify science school teachers' perspectives regarding environmental education-related activities in fundamental schools (11 to 14 year-olds). The interviewees' statements were divided into four categories for analysis. This paper discusses the category involving barriers, i.e., the difficulties encountered by school teachers in the development of environmental education. These difficulties are associated with both the school teacher's education per se and the school's infrastructure and organization. (Contains 12 references.) (Author/YDS)

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DIFFICULTIES THE SCIENCE SCHOOLTEACHER FACES TO IMPLEMENT ENVIRONMENTAL EDUCATION[1]

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Abstract

Considering the science teacher's role in the implementation of environmental issues in school, a survey was carried out (Benetti, 1998) to identify science schoolteachers' perspectives regarding environmental education-related activities in fundamental schools (11 to 14-year-olds). The interviewees' statements were divided into four categories for analysis. This paper discusses the category involving barriers, i.e., the difficulties encountered by schoolteachers in the development of environmental education. These difficulties are associated with both the schoolteacher's education *per se* and the school's infrastructure and organization.

Introduction

The school is a privileged place for students to access knowledge produced by humanity. As the institution responsible for the population's education, it is crucial that important issues that concern all of society, such as environmental ones, be considered to enable the school to successfully perform its social role (Carvalho, 1994).

Without disregarding the importance of other social segments involved in environmental education activities, we believe the school to be an important space for the development of educational practices in the sense of contributing toward the debate involving this theme. As Krasilchick points out, *"Among the various possibilities for the development of environmental education programmes, the formal education system is still that which offers the best conditions, due to its having an institutional basis, the school."* (1987a, 103).

Considering the schoolteacher's importance in the implementation of environmental issues at school, the survey carried out by Benetti (1998) aimed to identify the perspective of science schoolteachers regarding educational work involving these issues.

The survey

This investigation was carried out in 1996/1997, at the city of Marília, state of São Paulo, Brazil, and consisted of interviews with 31 science teachers in fundamental schools (of 11 to 14-year-olds). The data was collected through semistructured interviews and analyzed using a qualitative approach. The basic questions upon which the survey was developed were:

- Is the environmental theme present in Natural Science classes?
- What place does the theme have in those classes?
- What themes does the teacher discuss or consider important for discussion?
- Which aspects of the theme has the teacher prioritized?
- What teaching procedures have been employed?
- What difficulties has the teacher faced in his work involving environmental issues?

These questions constituted the "background" of the study and their purpose was to gain a better understanding of the following broader issues:

[1] Work partially financed by CNPq, Brazil.

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- Is the schoolteacher prepared to incorporate Environmental Education activities into his practices?
- What are the elements that could be identified as fundamental in continued and early teacher's education programs?

The schoolteachers involved were selected by random sampling and, at the time of the survey, they were distributed in 14 schools of the above-mentioned city.

The use of interviews as a research technique has proven to be the most suitable one for this type of study since, through his narrative, the interviewee places a variety of elements on his own unique and particular scale of values. It is, therefore, not a question of seeking direct answers to the survey's questions, but to apprehend "the participants' perspective"; in other words, to understand how the interviewed teachers see the phenomenon in question (André & Ludke, 1986; Bogdan & Bikden, 1994). Interviews provide elements from which one can infer the dynamics and unfolding of meanings, in this case those relating to the science teacher's work in the field of environmental education.

In the opinion of André & Ludkę (1986), the advantage of interviews over other survey techniques is that the desired information is obtained immediately and currently, allowing for clarification, correction and adaptation, and gaining life as the dialogue between interviewee and interviewer is established.

The interviews were carried out in one, two or three meetings, depending on the schoolteacher's availability, with a total duration of one to two hours recorded on an audio cassette, with the interviewees' prior consent. The flexible, semistructured format ensured a more freely flowing dialogue, enabling the teacher to talk about his/her experiences and expectations concerning his/her pedagogic work without losing sight of the survey's objectives. The material thus collected was subsequently transcribed in full and analyzed.

Based on the survey's objectives and an analysis of the interviewees' statements, the data was divided into four categories, giving rise to a discussion of the following factors: (a) the place of environmental issues in Sciences Education, (b) the focus given to those issues, (c) the procedures and resources used, and (d) the interviewees' perceptions regarding the barriers and difficulties that hinder the development of their environment-related teaching activities.

This paper focuses on a discussion of the barriers and difficulties that interviewees identified as limitations for the development of environmental education. Based on their statements, these barriers were classified into two subgroups, the first relating to the schoolteacher's education and the second to aspects pertaining to the school's infrastructure and organization (Figure 1).

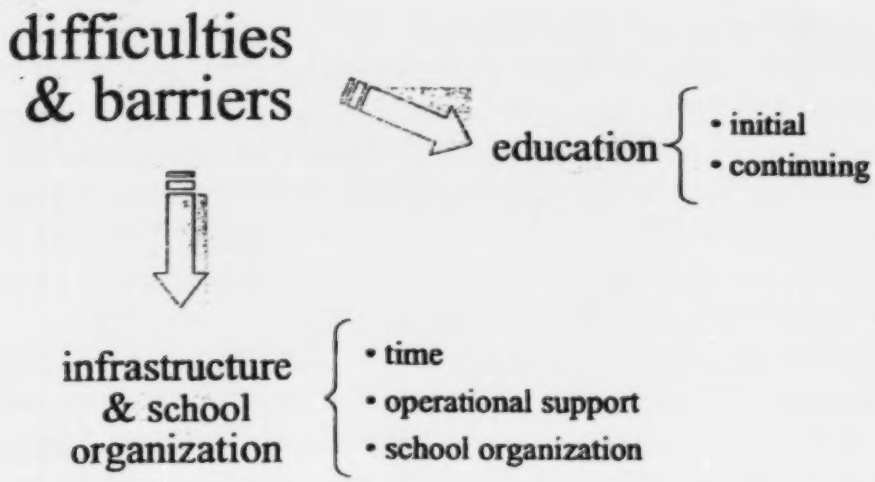

Figure 1. Barriers to the development of environmental education activities identified by science schoolteachers in fundamental schools (11 to 14-year-olds) of the city of Marilia, state of São Paulo, Brazil

The barriers identified by the interviewees are discussed below.

Aspects involving teacher's education

Among the difficulties pointed out by the science teachers, their basic education and a lack of continuing education programmes appear to be limiting factors to the development of educational work in environmental issues.

The statements of five schoolteachers indicated concern about the lack of a theoretical basis on the theme, starting from the early years of education, which may result in uncertainty in the development and deepening of discussions regarding the environment. The statement of one of the interviewees clearly illustrates this situation.

> R4[2]
> *"I guess you could say I am uninformed. It's not just me – I guess most science schoolteachers are. Take the greenhouse effect, for example. A few days ago there was a program on TV about pollution but I missed most of it because, by the time I started watching it, it was already almost at the end. It explained about thermal inversion, what acid rain is, what causes it...Related to some little thing, like those, you're uninformed. You may even tell students about it, but if a student begins asking you for more and more information, you* (find yourself thinking)[3] *– 'Wait a minute! I don't know either... I need to be better informed' ..."*

[2] To protect their identities, the interviewees are identified by a code consisting of a letter and a number.
[3] Complementary explain (words or expressions) are identified by round brackets.

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Four schoolteachers from this group see continuing education as a possible way to compensate for the gaps in their early education, as indicated in the following statement:

> S2
> *"More courses are needed. I have only recently started* (to teach) *and there are many things that are not taught in college. College teaches you the basics, but you have to do your own research, in depth... books don't always clarify everything, even one's doubt's. Sometimes, when we have a doubt, we ask another teacher with more experience. But sometimes you feel you're being inconvenient, that the person you're asking doesn't want to pass* (on his knowledge to you), *so you end up feeling reluctant to ask questions".*

The statement of S2 suggests that schoolteachers consider that undergraduate courses do not fully meet their own educational needs to deal with environmental issues in their teaching activities. Thus, as in the case of S2, the only possible way to offset the theoretical deficiencies of their own education is by requesting the help of a more experienced colleague or by reading up on the subject.

In addition to those five interviewees, others share the opinion that continuing education courses are needed. The schoolteachers mentioned the lack of guidance for the development of environmental-related activities, as evidenced in the statement of S1:

> S1
> *"... no one offers us courses, nobody says anything, and the whole thing is simply thrust into our hands and we have to deal with it. That's how it is, you know? I think we lack the guidance of someone who knows more than we do, to pass on the knowledge we need to work with. I think that is a very serious difficulty we face. (...) I read newspapers, I subscribe to Veja magazine* (Brazilian weekly magazine), *but I still think there is more* (she laughs) *that could be exploited and that I don't have. (...) I think we should have more guidance, you know?"*

An analysis of the above statements reveals that this difficulty is a common factor in the daily lives of these schoolteachers. Several complained of the lack of courses and of opportunities to exchange ideas with colleagues, etc. They believe that such educational elements would contribute toward an overall improvement of the way they develop their work, particularly in regard to the environmental theme.

It is worth mentioning that about 25% percent of the interviewees stated they found no difficulties regarding the content of environmental subject matter, because they had teaching experience or had read extensively on the subject. This is reflected in the statement of E3:

> E3
> *"I don't think I have many difficulties. Like I said, it depends on what content is to be discussed* (in class). *I don't consider it difficult, because it's something they* (the students) *like, it's a topic everybody is always talking about. I don't think it so difficult. Depending on the issue, of course, you sometimes don't find everything. Sometimes you find something by reading, a newspaper; that sort of thing could be done. We are doing everything that can be done."*

In the case of E3, it is obvious that the lack of difficulties reflects the superficiality and informality that the subject is dealt with. Some statements clearly indicate that professional experience is, to a certain extent, considered a substitute for formal education, in the sense that it offers solutions for content-related problems that arise on a day-to-day basis.

Aspects relating to the school's infrastructure and organization

The difficulties listed here involve aspects relating both to the school's infrastructure – such as availability of resources, financial and institutional support and to its organization – such as availability of the schoolteacher's time (for collective work, study and preparation of classes, or even time to develop classes).

Availability of time

The science teachers claimed that one of the most serious problems is lack of time to work with colleagues in order to exchange experiences and develop activities, and even to prepare classes. The following statement indicates that there are few opportunities for collective work due to the paucity of time for meetings.

> M2
> *"... we only do that in our collective planning activities. But that is the only time when everyone is available. It's the only time that we exchange experiences, during our joint planning activities. We have very little time to be together. We don't have enough time, most of us have many classes, many duties. In the end, we are prevented from having such a work group ".*

Some schoolteachers claimed that the excessive number of classes precluded them from dedicating more time to areas of knowledge such as the environmental themes.

It should be pointed out that the curricular organization itself fails to provide "time" for environmental issues to be explored, as interviewees L2 and L3 claimed. In the opinion of interviewee L3, the paucity of time in class would preclude the discussion of any issues other than the ones she mentioned:

> L3
> *"...school nowadays doesn't allow you to do much, there's too little time, you don't have much spare time for classes, see? Look, there are four Science classes; I had three in a row, I mean, there was still another one to give. With four classes you* (don't) *have much time to into anything in depth. Then there are meetings (...) so the students are allowed to leave* (the school). *This year there must have been about eight or nine course meetings that we had to attend, that one is obliged to attend and can't get out of (...)."*

Another difficulty identified by schoolteacher E4 is the time required for class preparation:

> E4
> *" Look, the schoolteacher's lack of time is the big problem. Because for* (me) *to sit down and prepare a class like that takes time, and time is what I have least of. So sometimes you have to prepare classes on Saturday. I prepare classes at home in the evening, I prepare classes on Sundays, I correct tests; I don't correct tests in the classroom, so I take them home. So you prepare those classes. Time has become very scarce because one has to rush.."*

Several interviewees identified some of the reasons why schoolteachers lack time. One of these reasons involves the work shift that some schoolteachers take on. The statement made by R3 exemplifies this situation:

> R3
> *"... our workday is very long. And there are teachers that teach at other schools, work in other places to earn money. Everything is a rush. Don't you rush? I do. So one rushes around a lot, takes on many classes and there's little time to prepare, to talk, to see what it is more important, and to discuss, to plan ... Drawing up a project takes time, it takes time, dedication, responsibility, integration, willingness..."*

Operational support

The interviewees mentioned the lack of various resources such as videotapes, books, libraries, financial and institutional support, etc.

Some said they would like to have more support materials such as books, magazines, newspapers, and videotapes. Such resources are considered useful for the development of work, mainly insofar as environmental issues are

concerned. However, they commented that such materials are not always available in school. About 50% of the schoolteachers mentioned the lack of the resources, and some added that they could not afford to purchase the necessary resources themselves due to their low wages, a claim that is illustrated by the statement below:

S1
"... I work, read a lot, and always try to keep informed. But the way things come down from the Bureau of Education, from the government, is the same as nothing. [Are things actually done more at the schoolteacher's level?][4] *The schoolteacher has to make things work! For instance, at the other state school they subscribed to the Globo Ciência magazine* (Brazilian scientific popular magazine) *So we had a source from which to obtain data. But then came a time when the subscription could no longer be renewed, nor could the schoolteachers, with their wages, afford it. So it's really difficult, isn't it?"*

The textbook, therefore, appears to be one of the few resources available for the schoolteacher's work, providing support for his/her teaching activities, as shown in E4's statement:

"... It's courses, it's I don't know what else, and so on. So you say: ' – Wait a minute, now what? I haven't prepared my class for that week, so let's see. ' You pick up a book, read it, make a summary, give them the summary, and that's how it goes. There is no material, no book that you find encompasses everything you need, you can't say 'I can even adopt this book for them, it won't be a problem'. Such a book doesn't exist."

It should be mentioned that textbooks are available to the schoolteacher firstly due a national government program that distribute books to schools. Besides that, as we can see in R3's statements, owing to the commercial strategy of the publishers who donate copies to schoolteachers, this type of material is the most available in schools and means cost and time savings to prepare classes.

"... I'm only sorry that I can't subscribe to more magazines because I earn so little and can't afford to have many different things. We get the textbooks free of charge. We get them from the publishers; some publishers supply schoolteachers with books, so I think that for that reason it's sometimes more convenient for me to use textbooks to obtain information, although that isn't enough. [Because access to them is easier?] *Also, I think, because we are given books. So every year you are given a collection, as advertising, which is to the publisher's interest. That book is available to you. That is sometimes the only material one has to work with."*

The interviewees also mentioned:
- The lack of teaching laboratories and materials (L2, C2, M2 and M4)
- The non-existence of libraries (R3 and F2)
- The lack of audiovisual equipment (slide projectors and video cameras) - (R2 and E1)

In the opinion of E1, the lack of resources prevents certain tasks from being performed, such as writing a report with his students about the living conditions in a slum close to the school, as he explains in his statement.

E1
"...if that material arrived... (referring to the possibility of the school acquiring a video recorder), *I don't know if it will, but I think it won't (...)* [And without that equipment you think it can't be done?] *Oh, no, it can't be done, it wouldn't be complete. For example, look, we're going to make up a group to have a look at the slum down there. But so what? How are they going to show it to their schoolmates later? With photos it would be rather empty. It's more interesting if it's dynamic, like a filmed report, with a host, and a reporter (...) I think the work would be much better presented if a video recording camera were used. They would become more aware, it would look good."*

[4] Questions presented by the interviewer are identified by square brackets.

This interviewee believes that, from that standpoint, his contribution to environmental issues is limited to passing on information and commenting on it. Moreover, he idealizes work that seems quite interesting. However, there is a noticeable overvaluing of technology (filming) in detriment of the subject to be studied. Such idealizing becomes an insurmountable barrier to the reflection and discussion of the issues intended to be dealt with.

According to the interviewees, other activities such as fieldwork are not carried out for lack of operational support. One of the interviewees referred to the difficulties of organizing and implementing activities outside the school by himself. Besides requiring the participation of colleagues, such activities involve several obstacles, i.e., the school's and students' resources, the difficulty of taking the student out of the school (which requires parental authorization), transportation, the number of students and classrooms. To illustrate this situation, interviewee E4 made the following statement:

> E4
> *"... taking a student out of the classroom is a very complicated, because you don't get any support (...) This year I was going to take them to that Experimental Farm in Lupércio* (village near Marília city) *but I didn't for that reason. We lack financial resources, and one has to pay an entrance fee. First you have to make a survey to find out how many would like to go, but then it's impossible to take seven fifth grades, because if I take one, the others also want to go (...). So it's very dificulty, because of the number of classes, which makes it more and more complicated. (...) And to select one student from one class, another from another class, I just can't do that, either everyone goes or no one does."*

Another concern regarding fieldwork has to do with the student's safety, as evidenced the statements of three schoolteachers and illustrated in that of R4:

> R4
> *"... I'd like to take them to the water treatment station, but to tell the truth I'm rather scared of taking them there because they're students, mostly fifth graders.(...). I'm afraid because some of those places are rather dangerous, it's over on the Marília-Assis road, near here."*

The school's difficulties regarding work organization and administration

The difficulties discussed in this section refer to the school's organization and administration and to the work atmosphere, which *per se* is seen as a barrier to any initiative aimed at broadening the scope of teaching on environmental themes. As an example, the following were mentioned:

- the excessive number of classrooms (M2)
- the noise in the corridor originating from an environment exploring activity outside the classroom (E1)
- the impossibility of engaging in activities outside the classroom with evening students (I1, A1, R4, L2, D1)
- the students' indifference to the issue, and to reading (L2, D1, A1, C1, S3, R4, E4)
- the lack of cooperation from co-workers and the school management in setting up a work group (E1, S3)

Another barrier mentioned by science teachers from four schools refers to the use of audiovisual resources, such as VCRs and TVs, regarding both the maintenance of the equipment and the execution of the activity itself. Three schoolteachers from this group mentioned, for instance, the difficulties involved in using those resources due to lack of support from the director's office.

Finally, another difficulty is worth mentioning, although it does not relate directly to the school, but rather, to policies of teacher valuation, i.e., the salary issue. In the opinion of some schoolteachers, some of the difficulties they pointed out are directly associated with their low wages, as, for example, the fact that they teach at more than one school, the fact that they engage in another profession besides teaching, the lack of resources to purchase books and magazines or even to attend courses. These factors, in combination or separately, are reflected in the schoolteachers' work. This dissatisfaction is clearly expressed in the statements of about 30% of the interviewees. The excerpt below illustrates this situation:

L3
"... working the way we do, the little that is left over... supposing you had the magazines, even I read those magazines. You know, the time that remains to you, to take the course outside of your work schedule... I think if we were well paid we would not engage in other activities. We would do only that work and we'd be interested in doing everything it involved. I mean, we'd be satisfied with our activities. But what happens to the schoolteacher today? He's going with the flow, he no longer feels encouraged."

Final considerations

We believe that an educational effort in this area should provide the student with possibilities to reflect about the real causes of environmental problems. This means it does not suffice to merely present environmental problems and their consequences to humanity and to the environment. It is necessary to offer information and suitable conditions to enable the student to comprehend the nature of current environmental problems. As Layrargues points out, problems are often emphasized as being intrinsic to humanity rather than deriving from a model of society, so that "The social actors disappear, and the social conflict becomes invisible" (1999:51).

In this sense, reductionist or fatalistic approaches contribute little to the development of a conscience and a critical attitude regarding this theme. Several authors (Carvalho, 2000; Layrargues, 1999; Gonçalves, 1990; Krasilchick, 1986) have discussed the risks of reducing the discussion of environmental problems to their biological aspects, disregarding the socioeconomic, political and cultural factors involved in the issue.

An approach to environmental issues that meets these perspectives is a challenge that the school will have to face. It is essential, therefore, to take into account the participation of one of the main agents of the educational process – the schoolteacher. In addition to being suitably prepared, the schoolteacher must also be aware, sensitive to the importance of the educational process in the discussions, because, as Trivelato (1994) and Krasilchick (1987b) point out, the implementation of changes in school depends on the teacher's involvement.

This survey revealed that schoolteachers consider environmental issues significant. However, their statements indicate that there are a variety of barriers and difficulties for the development of educational work involving those issues, such as insufficient formal education, lack of resources and time, and the way the school is organized.

The time factor stands out as the most relevant barrier hindering the development of environmental issues in the classroom. The lack of time is actually a reality to teacher's work in Brazil and we have to recognize that this factor restrict any science teacher's activity. This problem is more relevant when we are trying to deal with issues that are not seen as traditionally linked to science curriculum.

The teacher's education in this sense is considered a cause of this problem; in other words, a schoolteacher can only teach the knowledge that he was formally educated in, which means his perspective is merely that of reproduction and multiplication. In such circumstances, continued education would, in a sense, play the role of "filling the gaps" of insufficient formal education.

The science teacher's work lacks a perspective for innovation and construction. The support material for his/her work has proved limited, be it textbooks, magazines, newspapers or television. Furthermore, the superficial and alarmist tone of the major means of social communication is reflected in the performance of most science teachers interviewed.

As for the difficulties associated with the school's infrastructure and organization, it was found that the schoolteacher feels incapable of facing the institution's inertia vis-à-vis innovative situations. A collective garbage recycling activity or more frequent outings for field activities, for instance, are seen as problems.

Admittedly, there are difficulties; however, by failing to face them, the teacher makes these barriers insurmountable.

Contreras (apud Libâneo, 2001) states that the resistance of schoolteachers to change and their scant enthusiasm for the profession may be originate from a process whereby educators adapt to some of the institution's expectations. Teachers live with the school culture and learn how to adjust their perspectives and expectations to those of the institution in regard to their work. There are three approaches upon which schoolteachers base their work: a) presentism – the schoolteacher concentrates all his/her efforts on short term classroom plans; b) conservatism – the schoolteacher resists changes in his performance and avoids discussions about commitments to them; c) individualism – the schoolteacher refuses the help of colleagues for fear of having his work judged or criticized.

Many of the obstacles listed by the schoolteachers as objective difficulties may be reflexes of others originating from the school. In a discussion about the recent theorizations regarding the introduction of practices of reflexivity in the context of schoolteacher actions, Libâneo (2001) highlights the importance of not ignoring some of the conditions of the institutional and social reality of Brazilian schools. According to this author, some of these factors involve the precariousness of the teachers' work conditions and his/her professional education, the latter involving not only educational content but also the teacher's overall culture; the forms of organization of the educational system and its policies; and the conflicting roles that the schoolteacher often has to play vis-à-vis the different issues emerging from society, such as poverty and violence.

Analyzed from this standpoint, one realizes that the question of barriers discussed herein is a far more complex one. We believe that overcoming this situation is not limited simply to improving the teacher's educational qualifications or continued education courses so that the science teachers can discuss environmental issues more widely and on a more contextualized basis.

Notwithstanding the difficulties claimed by the interviewees, we believe that they cannot be seen as definitive obstacles to any educational work differing from the normal. A study of the teacher's perspectives concerning this theme may be fundamental for the establishment of strategies to overcome these difficulties.

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Author(s): Bizzo, N. et alii (eds.)

Corporate Source:	Publication Date:
School of Education, University of São Paulo, Brazil	July 2002

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